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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
JANAKIRAMAN, NITHYA	
ART UNIT	**PAPER NUMBER**
2123	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/28/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/723,337	HATFIELD ET AL.	
	Examiner	Art Unit	
	Nithya Janakiraman	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) *13-21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 22-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *13-21* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/4/04, 3/15/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to the application filed on November 26, 2003. Claims 1-12 and 22-37 are presented for examination.

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-12, and 22-37, drawn to a method of modeling the effect of a molecular contaminant film on performance of an optical system, classified in class 703, subclass 2.

II. Claims 13-21, drawn to a method of obtaining a per unit absorbance spectrum of a contaminant film when the thickness of the film is unknown, classified in class 438, subclass 14.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed

because the method of modeling the effect of a molecular contaminant film on performance of an optical system does not necessarily require obtaining a per unit absorbance spectrum of a contaminant film when the thickness of the film is unknown. The subcombination has separate utility such as obtaining a per unit absorbance spectrum.

The examiner has required restriction between combination and subcombination inventions. Where applicant elects a subcombination, and claims thereto are subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable subcombination will be examined for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mark Saralino on Tuesday, December 19, 2006 a provisional election was made without traverse to prosecute the invention of a method of modeling the effect of a molecular contaminant film on performance of an optical system, claims 1-12 and 22-37. Affirmation of this election must be made by applicant in replying to this Office action. Claims 13-21 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Usage of the term "about 1 micron" is indefinite. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before

> the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-12 and 22-37 are rejected under 35 U.S.C. 102(e) as being anticipated by US PGPub 2003/0068834, Kishkovich et al (hereinafter Kishkovich).

3. Regarding claim 1 (and 22), Kishkovich teaches:

A method (and computer system) of modeling the effect of a molecular contaminant film on performance of an optical system (see paragraph [0009], "...the sample collecting media can emulate the environment of the optical surfaces of interest..."), comprising the steps of:

correlating a mass of material outgassed from materials of the optical system to a spectrum of outgassed products (see paragraph [0001], "...sampling air and purge gases...followed by analysis", paragraph [0048], "Fig. 4 illustrates this relationship...");

normalizing the spectrum of outgassed products (see paragraph [0041], "The breakthrough volume is the amount of gas sample volume required to go beyond the absorbent capacity...");

predicting an aggregate molecular contaminant film thickness from each material (see paragraph [0002], "The detection and quantification of compounds having a higher molecular weight...");

deriving an absorbance spectrum of the aggregate molecular contaminant film (see Equation 2);

convolving the absorbance spectrum of the aggregate molecular contaminant film with an instrument function of the optical system (see Figure 2); and

plotting at least one transmission band as a function of source temperature (see paragraph [0039]).

4. Regarding claim 2 (and 23), Kishkovich teaches:

The method (system) of claim 1, wherein the step of predicting the aggregate molecular film thickness includes the step of summing a weighted spectrum of each individual component's outgassed product to form the aggregate molecular contaminant film (see paragraph [0002], "...total trap capacity...").

5. Regarding claim 3 (and 24), Kishkovich teaches:

The method (system) of claim 1, wherein the step of correlating the mass of material outgassed from materials of the optical system to a spectrum of outgassed products includes the steps of (see paragraph [0001], "...sampling air and purge gases...followed by analysis", paragraph [0048], "Fig. 4 illustrates this relationship..."):

classifying each outgassed material into one of several groups based on at least one observed characteristic of the outgassed material (see paragraph [0002]);

obtaining an absorbance spectrum of a sample of the outgassed material (see paragraph [0004]); and

estimating a thickness of the sample of outgassed material based on the absorbance spectrum and the classification of the outgassed material (see paragraph [0007], "...further includes collecting contamination which comprises refractory compounds, and high and low molecular weight...").

6. Regarding claim 4 (and 25), Kishkovich teaches:

The method (system) of claim 3, wherein the step of obtaining the absorbance spectrum of the sample of the outgassed material includes the step of obtaining an average absorbance spectrum of a sample of the outgassed material (see paragraphs [0026], [0029]).

7. Regarding claim 5 (and 26), Kishkovich teaches:

The method (system) of claim 3, wherein the step of classifying each outgassed material into one of several groups includes the groups consisting of a contaminant that is a pure substance that is a liquid at room temperature (Type 1 sample) (see paragraph [0061]), a contaminant that is not a liquid or a pure substance but spectrum indicates that an absorbance in a region of interest is dominated by a single functional group (Type 2 sample) (see paragraph [0063]), and a contaminant whose outgassing products are not a pure substance and cannot be represented by a single model compound that is a liquid (Type 3 sample) (see paragraph [0065]).

8. Regarding claim 6 (and 27), Kishkovich teaches:

The method (system) of claim 5, further comprising the steps of: estimating the thickness of the Type 1 sample based on the geometry of the Type 1 sample (see [0034]);

estimating the thickness of the Type 2 sample based on a known material that has a similar absorbance spectrum as the absorbance spectrum of the Type 2 sample (see paragraph [0040], "Higher capacity traps yielding longer collection times may be necessary for certain applications"); and

estimating the thickness of the Type 3 sample based on a synthetic spectrum constructed from model vectors of known materials that approximates the absorbance spectrum of the Type 3 sample (see paragraph [0052], "...may comprise high molecular weight organics...carbon atoms within the range of approximately six to thirty carbon atoms...").

9. Regarding claim 7 (and 28), Kishkovich teaches:

The method (system) of claim 6, wherein the step of estimating the thickness of the Type 1 sample includes the steps of:

estimating the thickness of the Type 1 sample based on a mass of the Type 1 sample, an area occupied by the Type 1 sample, and a density of the Type 1 sample (see paragraph [0016], "...sample mass in a trap..."; claim 1, "...representative of a sample volume...").

10. Regarding claim 8 (and 29), Kishkovich teaches:

The method (system) of claim 6, wherein the step of estimating the thickness of the Type 2 sample includes the steps of:

selecting a material that has a similar absorbance spectrum as the absorbance spectrum of the Type 2 sample (see paragraph [0029]);

obtaining an absorbance spectrum of the selected material, wherein the thickness of the selected material is about 1 micron (see paragraph [0036], "...dimension variation in 150 nm lithography...optics contamination in proportion to the location and thickness..");

scaling the absorbance spectrum of the sample of the selected material by a scale factor to obtain a vector that approximates the strength of the absorbance spectrum of the Type 2 sample (see paragraph [0064], "...improved by a factor of 10..."); and

estimating the thickness of the Type 2 sample as the product of the scale factor and the thickness of the selected material (see paragraph [0064], "...improved by a factor of 10...").

11. Regarding claim 9 (and 30), Kishkovich teaches:

The method (system) of claim 6, wherein the step of estimating the thickness of the Type 3 sample includes the steps of:

combining normalized vectors for known model compounds (see paragraph [0037], "...some combination of adsorptive and chemisorptive media ...the contaminants in air and gas streams...");

assigning a thickness to each vector (see paragraph [0036], "...the location and thickness of the contaminating film...");

manipulating the thickness assigned to each vector to construct an initial synthetic spectrum that approximates the absorbance spectrum of the Type 3 sample (see paragraph [0069], "the filtering system may be constructed without limitation...");

estimating the thickness of the Type 3 sample as the summation of the thickness assigned to each vector of the initial synthetic spectrum (see paragraph [0054], "...the gas additive combines with the surface contaminant to form a volatile compound...").

12. Regarding claim 10 (and 31), Kishkovich teaches:

The method (system) of claim 9, further comprising the steps of:

identifying an error region of the initial synthetic spectrum (see paragraph [0068]);

adding at least one normalized vector for known model compounds to the initial synthetic spectrum, wherein the at least one added vector compensates for a residue in the error region of the initial spectrum (see paragraph [0070]);

assigning a thickness to the at least one added vector (see paragraph [0054]);

manipulating the thickness of the at least one added vector to minimize the residue in the error region of the synthetic spectrum (see paragraph [0069]);

adding the manipulated thickness of the at least one vector to the estimated thickness of the Type 3 sample when the residue is positive (see paragraph [0067]); and

subtracting the manipulated thickness of the at least one vector to the estimated thickness of the Type 3 sample when the residue is negative (see paragraph [0024]).

13. Regarding claim 11 (and 32), Kishkovich teaches:

The method (system) of claim 9, further comprising the step of weighting the thickness of each model compound by the density of the compound (see paragraph [0002]).

14. Regarding claim 12 (and 33), Kishkovich teaches:

The method (system) of claim 3, further comprising the step of deriving a per unit absorbance spectrum of the sample of outgassed material (see paragraph [0048]).

15. Regarding claim 34, Kishkovich teaches:

The method of claim 22, wherein the computer program further causes the processor to generate a contour plot, wherein the contour plot includes the at least one transmission band plotted as a function of a source temperature for a range of aggregate molecular contaminant film thicknesses (see Figure 4).

16. Regarding claim 35, Kishkovich teaches:

The method of claim 22, wherein the computer program further causes the processor to:

calculate a ratio of a first transmission band and a second transmission band (see Figure 3); and

plot the ratio as a function of a source temperature (see Figure 2).

17. Regarding claim 36, Kishkovich teaches:

The method of claim 1, wherein the step of correlating the mass of material outgassed from materials of the optical system to the spectrum of outgassed products includes using an infrared spectrum of outgassed products (see paragraph [0035], "...lower wavelengths of electromagnetic spectrum are used to provide for the fabrication of smaller features").

18. Regarding claim 37, Kishkovich teaches:

The method of claim 1, wherein the step of correlating the mass of material outgassed from materials of the optical system to the spectrum of outgassed products includes using a mass of material outgassed from organic materials (see paragraph [0034], "...wide range of airborne or gaseous molecular organic contaminants...").

Additional References

19. Additional prior art which addresses the inventive concept at hand are:

- US Patent 7,053,355: Image sensor unit for manufacturing optical lithographic equipment e.g. photomask and stepper, lens aberration calibration, focus calibration, and stepper monitoring including contamination monitoring.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nithya Janakiraman whose telephone number is 571-270-1003. The examiner can normally be reached on Monday-Thursday, 8:00am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571)272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-

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12/22/06